Life cycle cost analysis (LCCA) of corrosion resistant steel based on long-term corrosion monitoring

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Corrosion of carbon steel (CS) reinforcement is the main cause for deterioration of concrete structures. Especially in Cl^- contaminated environments continuous maintenance and repair works are needed to avoid significantly reduced service life of the structure.

The use of stainless steel (SS) reinforcement is considered as one of the best methods for protection of reinforced structures exposed to Cl^-, but due to high cost its use is usually limited to critical structural parts. The financial evaluation should not be based only on initial construction costs, since the corrosion resistance of steel can influence the costs later in the life of a structure. It should be made by taking into account the costs through entire life of the structure (Life Cycle Cost Analysis, LCCA).

Our past laboratory results show good comparison between different types of SS reinforcement. These steels were embedded in concrete columns and exposed to marine environment in the coast of Krk island (FP6 ARCHES) and the Port of Koper (FP7 TRIMM). Galvanostatic pulse on reinforcing steels, thicknesses of electrical resistance (ER) probes and partial currents on coupled multi-electrodes were measured. Our study indicate that traditional SS in marine environment behave significantly better than CS and that the use of certain types of SS with lower content of alloying elements could also be efficient substitute for traditional SS. Based on our study, the examples of LCCA for a simple structure will be given.